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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/915,145	07/25/2001	Takeshi Nogami	09792909-5092	6448

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EXAMINER
MAGEE, THOMAS J

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 07/03/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/915,145	Applicant(s) NOGAMI ET AL.	
	Examiner Thomas J. Mage	Art Unit 2811	

-- Th MAILING DATE of this communication appears on the cover sheet with the correspondenc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-7 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-7 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections – 35 U.S.C. 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 6 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The claim is directed to a method for forming a cobalt silicide layer by exposing the "cobalt including layer" (CoWP) in a system containing a silane gas. The specification discloses (Page 8, lines 7 – 19) that the substrate is introduced into a CVD system and the base substrate "heated up to a predetermined temperature" to form the CoSi2 layer. This is not sufficient or definitive information to enable one skilled in the art to form the silicide layer. Temperature and even ramp conditions are extremely critical for this process and will define the phase of silicide nucleated. Further, there are no gas mass flow rates, or pre-soak conditions presented. A great deal of experimentation would be required for one to practice the invention because of the inordinate number of variable elements required in a DoE (design of experiments) matrix for optimization.

Claim Rejections – 35 U.S.C. 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1 – 5, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lopatin et al. (US 6,259,160 B1) in view of Dubin et al. (US 5,695,810), Shacham-Diamand ("High Aspect Ratio Quarter-Micron Electroless Copper Integrated Technology," Proc. Materials for Advanced Metallization Workshop (Europe) (1997) pp. 11-14), and Matsushita et al. ("Narrow CoSi2 Line Formation on SiO2 by Focused Ion Beam, " Proc. International Conf. On Ion Implantation Technology, Vol. 2, (1998) pp. 861 – 864).

Lopatin et al. disclose a structure containing a barrier liner material (TaN) filled with copper (40,41) (See Figure 1). After subsequent deposition of a copper plug atop the first interconnect, a CoWP layer (60) (See Figure 4) is formed (Col. 7, lines 47 – 48) around the copper as an oxidation resistant layer. A similar CoWP "barrier" layer deposited on copper is disclosed by Dubin et al. (Col. 9, lines 57 – 62). Lopatin et al. do not disclose the formation of a cobalt silicide layer on the surface of the CoWP layer. However, Matsushita et al. disclose the formation of a cobalt silicide layer by focused ion beam irradiation of stacked silicon and cobalt films (Co/Si) on a substrate. Further,

Shacham-Diamand et al. disclose the electroless deposition of copper, followed by electroless deposition of CoWP with sputtered films of Co and Si atop the CoWP to produce the sequence, Cu/CoWP/Co/Si. It would then be obvious to one of ordinary skill in the art to use the focused ion beam process of Matsushita et al. on the film sequence of Shacham-Diamand to produce the cobalt silicide cladding layer on the surface of the CoWP.

Conclusions

5. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to **Thomas Magee**, whose telephone number is **(703) 305-5396**. The Examiner can normally be reached on Monday through Friday from 8:30AM to 5:00PM (EST). If attempts to reach the Examiner are unsuccessful, the examiner's supervisor, **Tom Thomas**, can be reached on **(703) 308-2772**. The fax number for the organization where this application or proceeding is assigned is **(703) 308-7722**.

Tom Thomas

TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

Thomas Magee
June 28, 2002